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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,806	07/10/2003	Hiroyuki Sonoda	8019-1031	1907

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EXAMINER

VESPERMAN, WILLIAM C

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 02/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary

Application No.

10/615,806

Applicant(s)

SONODA ET AL.

Examiner

William C. Vesperman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1 and 3-13 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is in response to applicant's election of 11/22/2004.

Election/Restrictions

2. The examiner wishes to acknowledge the applicant's election without traverse of Claims 1 –13.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, and 3 -13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orie et al. (US 6,513,537) in view of Ma et al. (US 5,783,101) and further in view of Mikami et al. (US 6,197,733).

In regards to Claims 1, 3, 4, 10 and 11, Orie et al. teaches (Abstract, column 2, lines 30 – 42, column 11, lines 8 -12) a method of removing a polymer and metal contaminations deposited on a sidewall of a substrate having a metal layer. Orie et al. teaches that the deposited polymer can be dissolved by a chemical liquid in an inert atmosphere, and subsequently, the remaining metal on the sidewall is oxidized by mixing oxygen with the inert atmosphere after the polymer has been dissolved. This

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step can be repeated several times until the polymer and metal particles have been removed. Following, the steps of dissolving the deposited polymer on the sidewall and oxidizing the remaining metal on the sidewall with an oxygen containing atmosphere. IPA or pure water is used to clear or remove the dissolved products and atmosphere.

Ma et al. (US 5,783,101) teaches (columns 1, 2 lines 15 – 4) that polymer residues generated by etching a metal layer (aluminum containing a percentage of copper) and a photoresist polymer tends to deposit polymer on the sidewalls of the etched metal walls which causes problems such as a distorted etched metal sidewall profile.

Accordingly, it would have been obvious to one of ordinary skill in the art to combine to combine the teaching of Orie et al. and Ma et al. in order to develop a method to remove deposited polymer residues on sidewalls and oxidize the remaining metal as taught by Orie et al., utilizing etched metal (aluminum containing a percentage of copper) walls having photoresist polymer deposits as taught by Ma et al. One of ordinary skill would be motivated to combine the teaching of both Orie et al. and Ma et al. in order to develop a method to remove problem photoresist polymer from metal etched sidewalls in order to improve the profile of the etched metal sidewall and the performance of the integrated circuit.

In regards to Claims 5, 6, 7 and 8, Orie et al. teaches (column 9, 10, lines 20 – 21) the step of rotating the substrate in an inert hot nitrogen atmosphere in order to remove chemicals used to dissolve the deposited polymer and rotating the substrate in a partly oxygen containing atmosphere to oxidize the remaining metal.

In regards to Claim 9, Orie et al. teaches (columns 11 and 12, lines 6 – 29) the steps of removing the dissolved polymer and the steps of removing the oxidized metal can be repeated several times alternatively.

In regards to Claim 12, Orie et al. teaches (Figure 8) a barrier layer (72) formed on the metal layer (71).

In regards to Claim 13, over Orie et al. and Ma et al. (US 5,783,101) are silent about the chemical for dissolving the deposited polymer being ammonium fluoride, but Mikami et al. is not. Mikami et al. teaches (Abstract) that ammonium fluoride is a photoresist ashing residue cleaning agent.

Accordingly, it would have been obvious to one of ordinary skill in the art to combine to combine the teaching of Orie et al. and Ma et al. with that of Mikami et al. in order to develop a process for removing photoresist polymer from etched sidewalls as taught by Orie et al. and Ma et al. using ammonium fluoride as a photoresist polymer cleaning agent as taught by Mikami et al. One of ordinary skill would be motivated to use ammonium fluoride as a photoresist polymer cleaning agent since it is a well known agent for dissolving photoresist polymer.

Allowable Subject Matter

5. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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The following is a statement of reasons for the indication of allowable subject matter. The prior art does not teach or suggest in combination with the base claim, wherein the steps of dissolving the polymer, the metal and rinsing the chemicals out of the substrate by pure water are all carried in an oxidation atmosphere.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure.

Joyce et al. (US 6,764,552) teaches supercritical solutions for cleaning photoresist and post-etch residue.

Cathey, Jr. (US 5,024,722) teaches a process for fabricating conductors for integrated circuit connections.

Hsia et al. (US 6,162,724) teaches a method for forming metallization for inter-layer connections.

Loy et al. (US 6,284,908) teaches a method for making polysilsequioxes and organohydridosilanes.

Johnston et al. (US 2003/0065055) a method for manufacturing drag-reducing polymer suspensions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Vesperman whose telephone number is 571-272-1701. The examiner can normally be reached on Mon. - Fri., 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

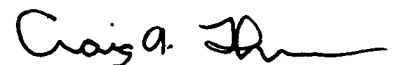
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WCV

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January 27, 2005



**CRAIG A. THOMPSON
PRIMARY EXAMINER**